Position correction / resolution -- update

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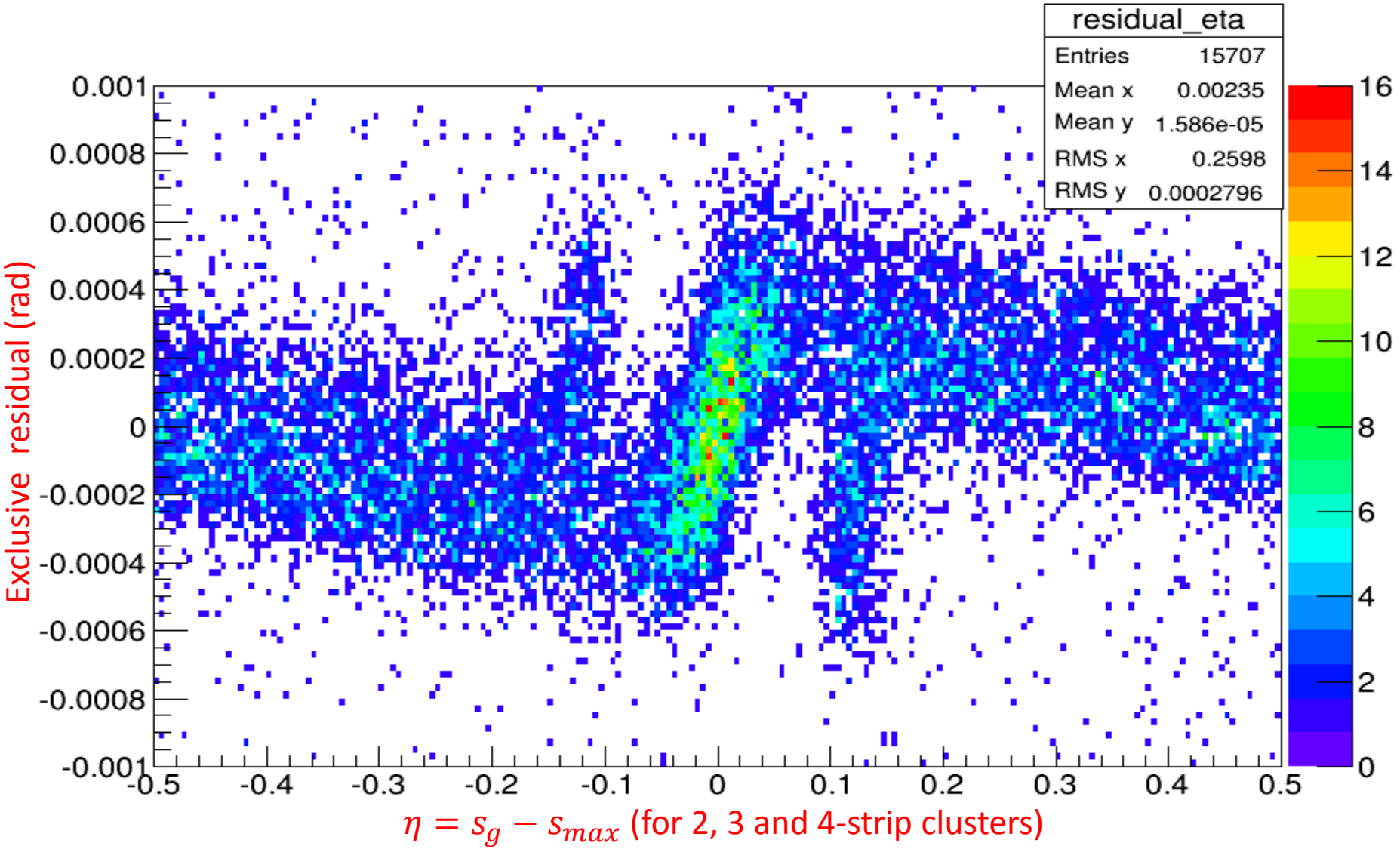
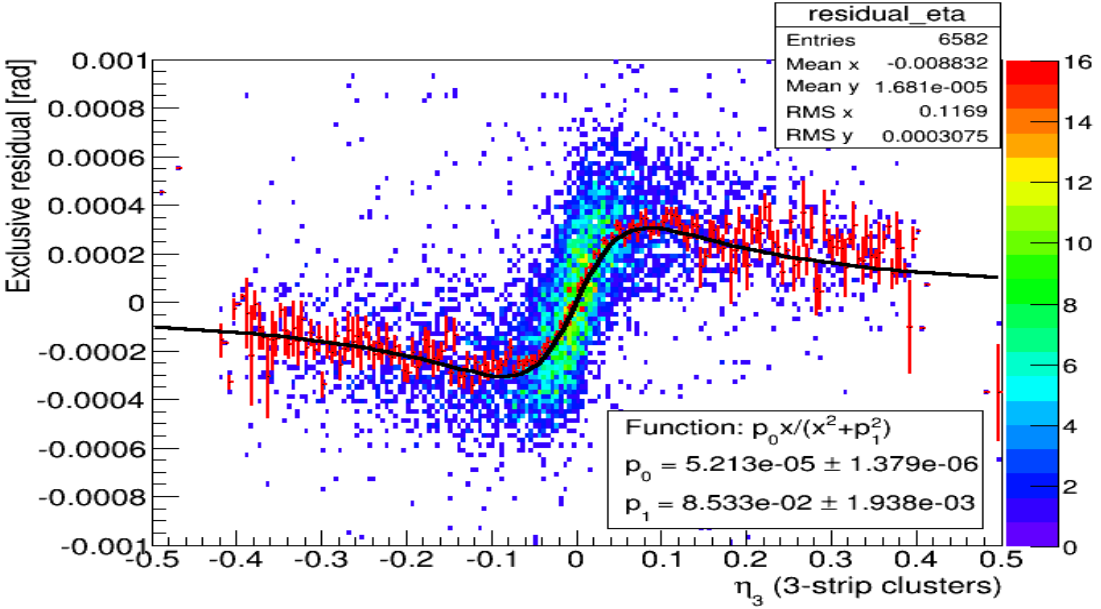
HV scan data combined, 2,3,4-strip clusters are selected.

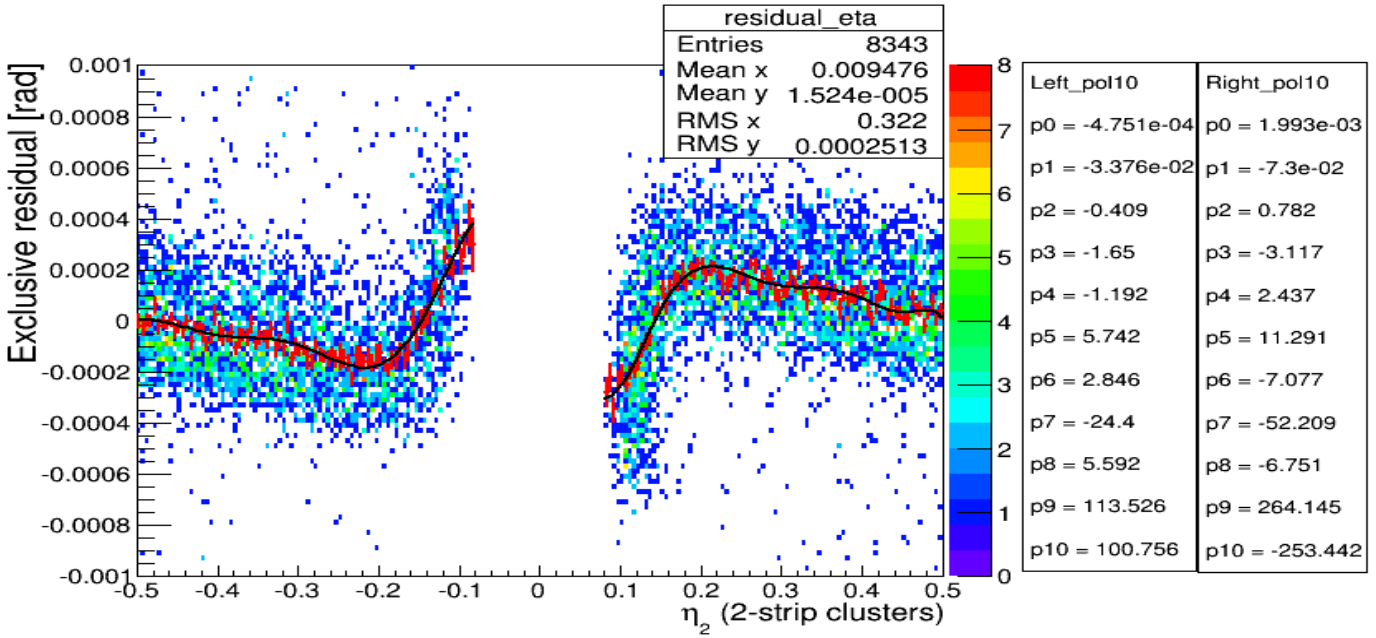


- Combined zigzag HV scan data, 90k raw events.
- Single cluster in every event in every detector; cluster size in trackers >=1.

3-strip clusters case:
Profile is fitted with a serpentine function



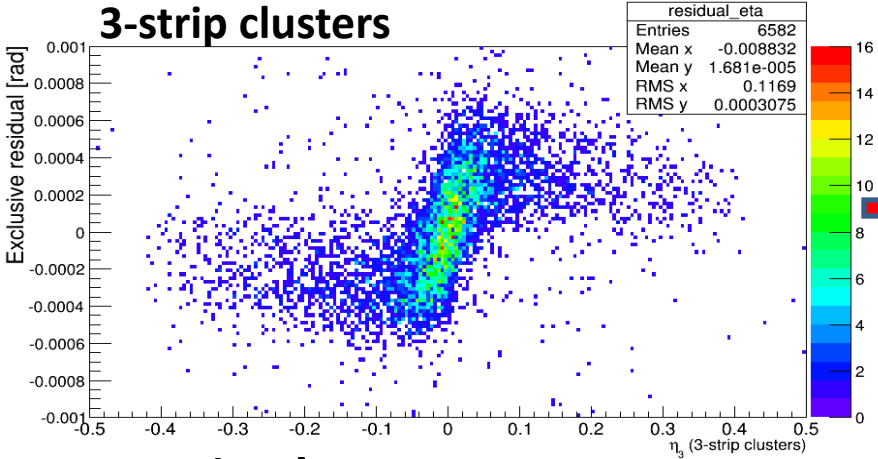
2-strip clusters case:
Profile is fitted with two deci-polynomials (degree 10)



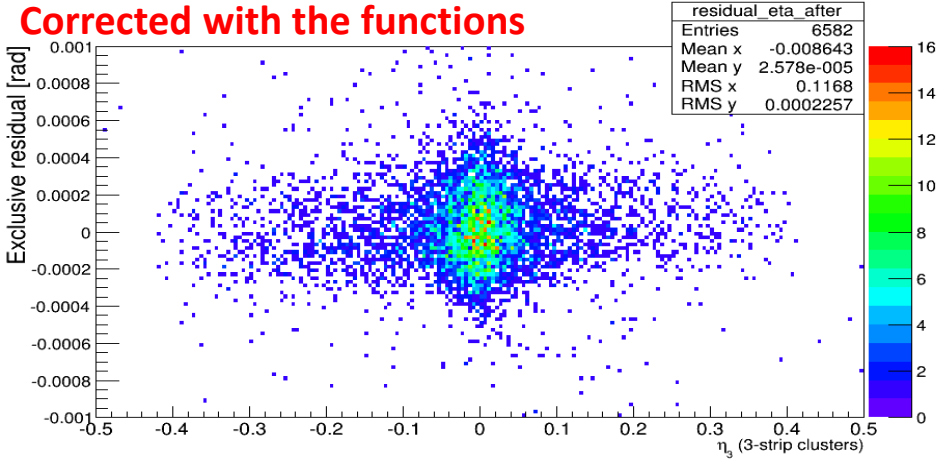
$Residual = \varphi_p - \varphi_m$, φ_p is the cluster position on the zigzag GEM given by trackers, φ_m is the position measured by the zigzag GEM.

$Residual' = \varphi_p - \varphi_m - f(\eta)$, pulls residual mean towards zero fall all η values.

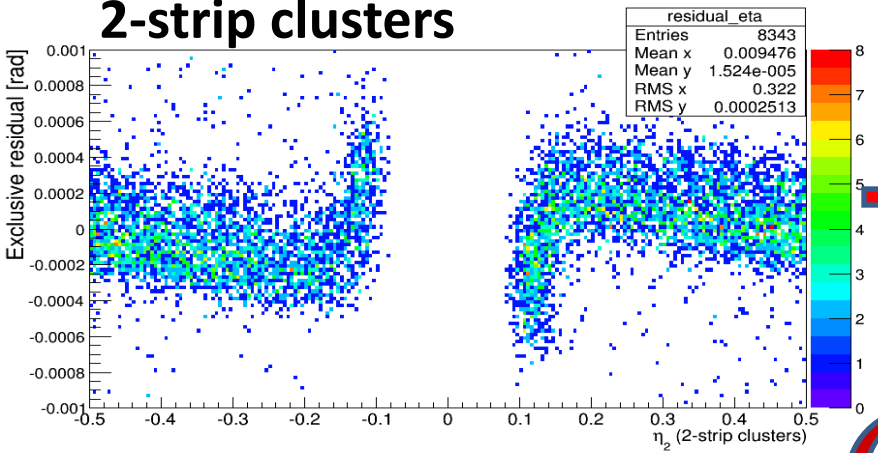
3-strip clusters

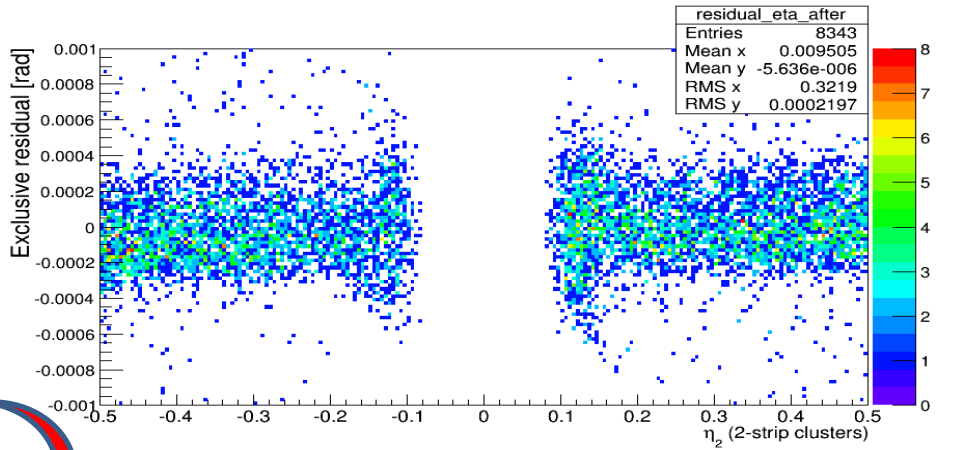


Corrected with the functions

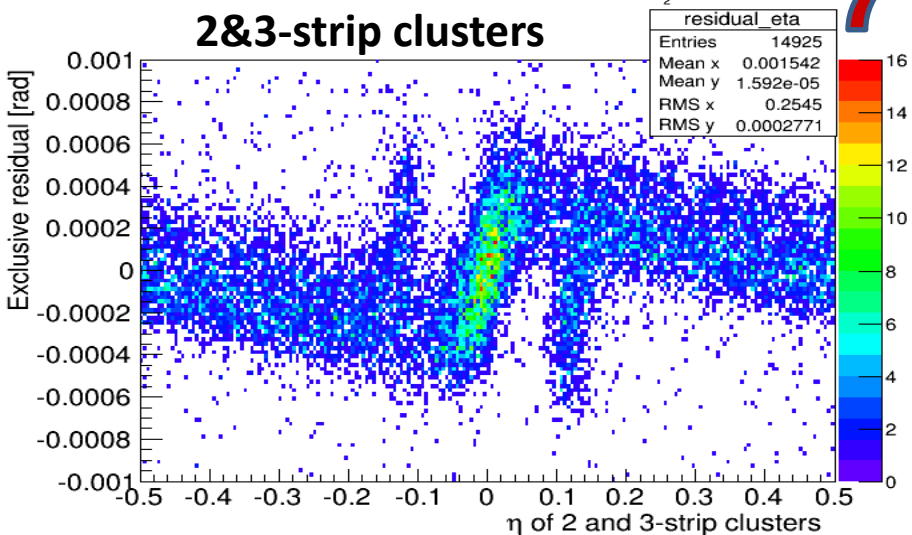


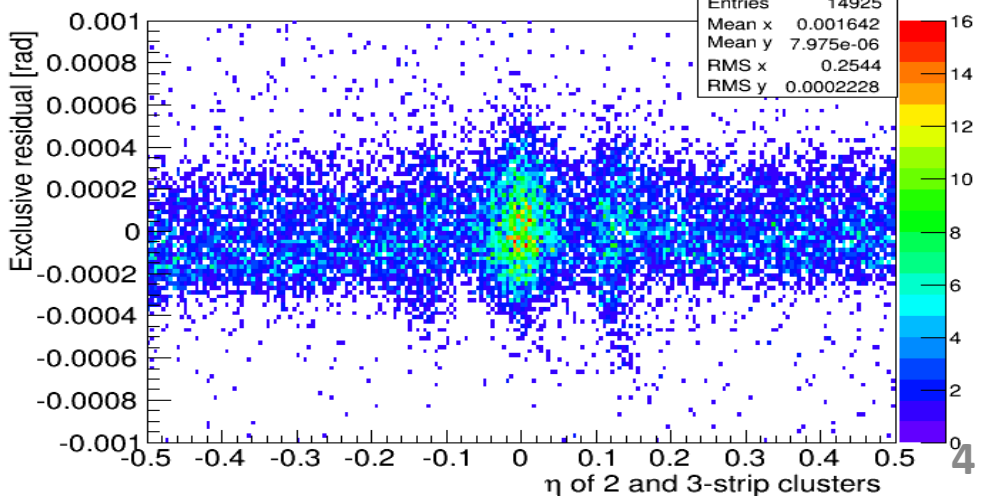
2-strip clusters



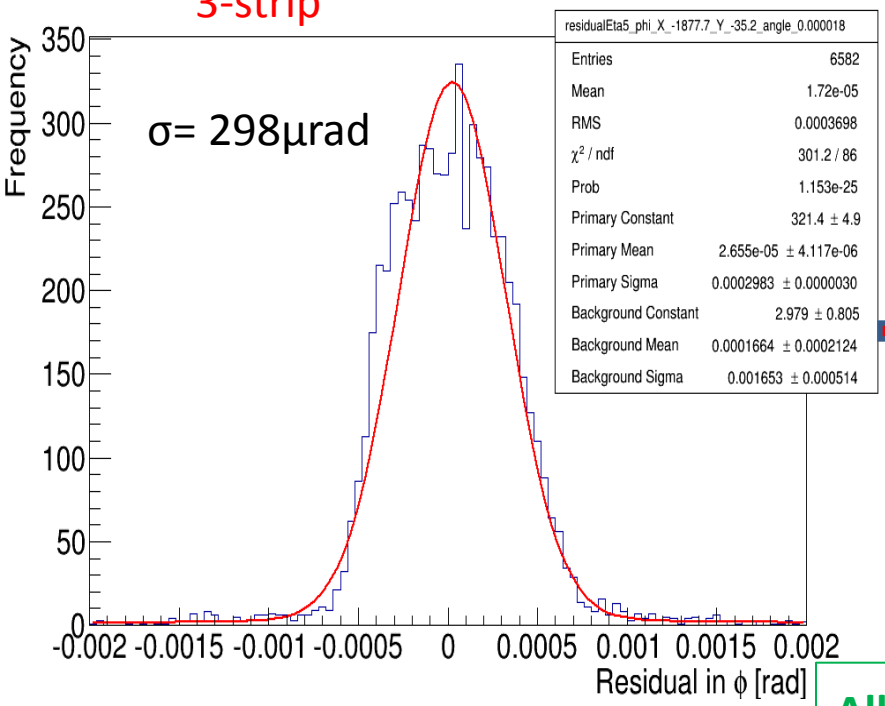


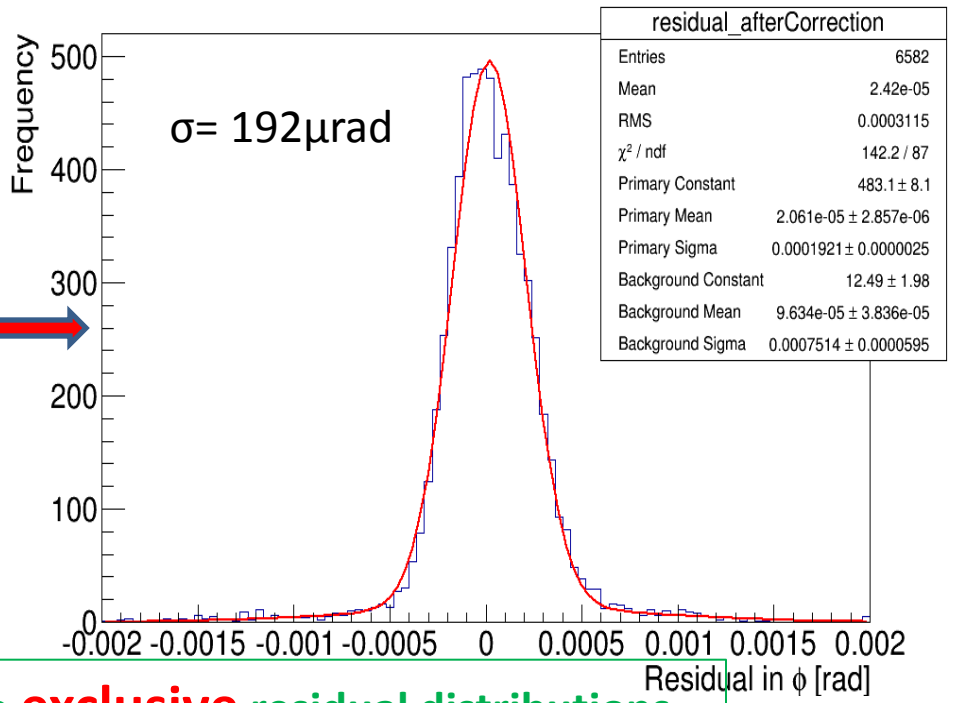
2&3-strip clusters





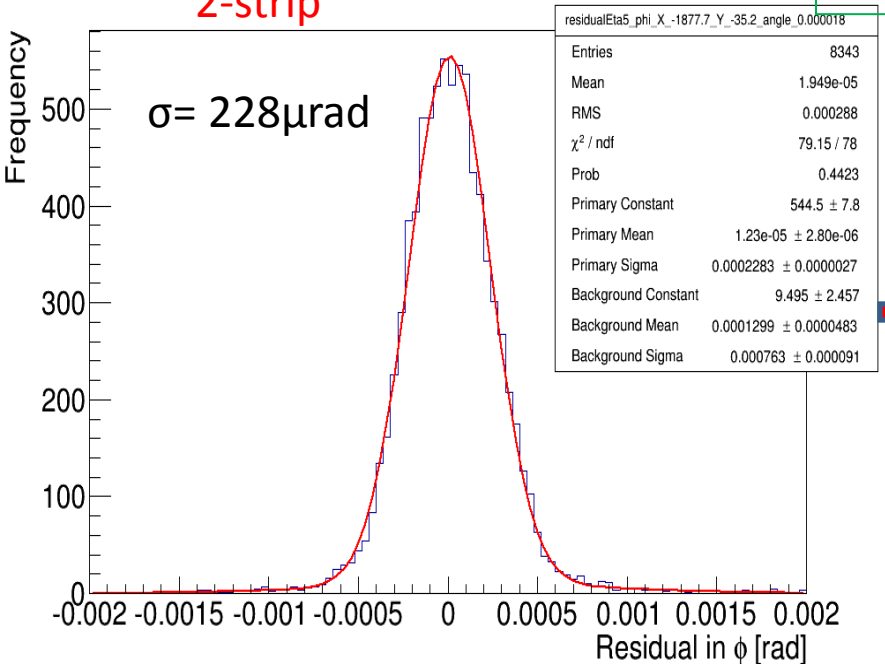
3-strip

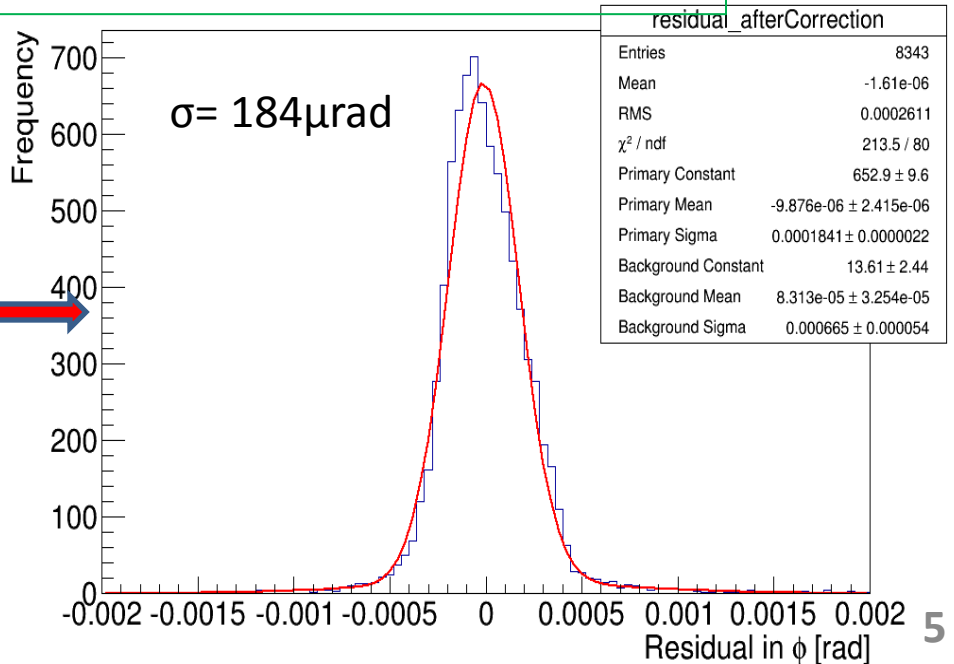




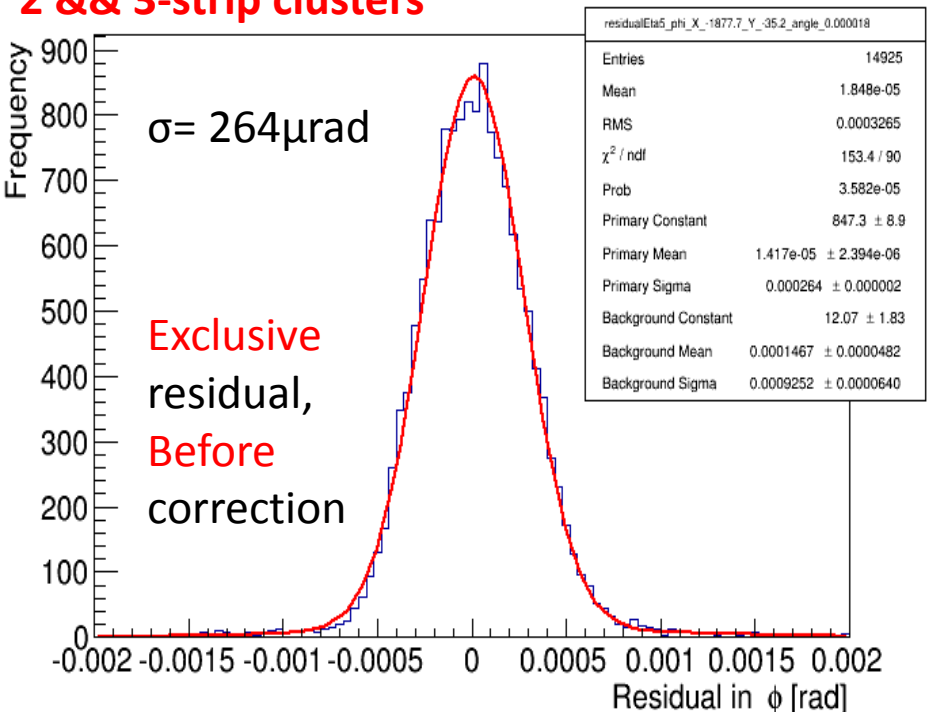
All are **exclusive** residual distributions

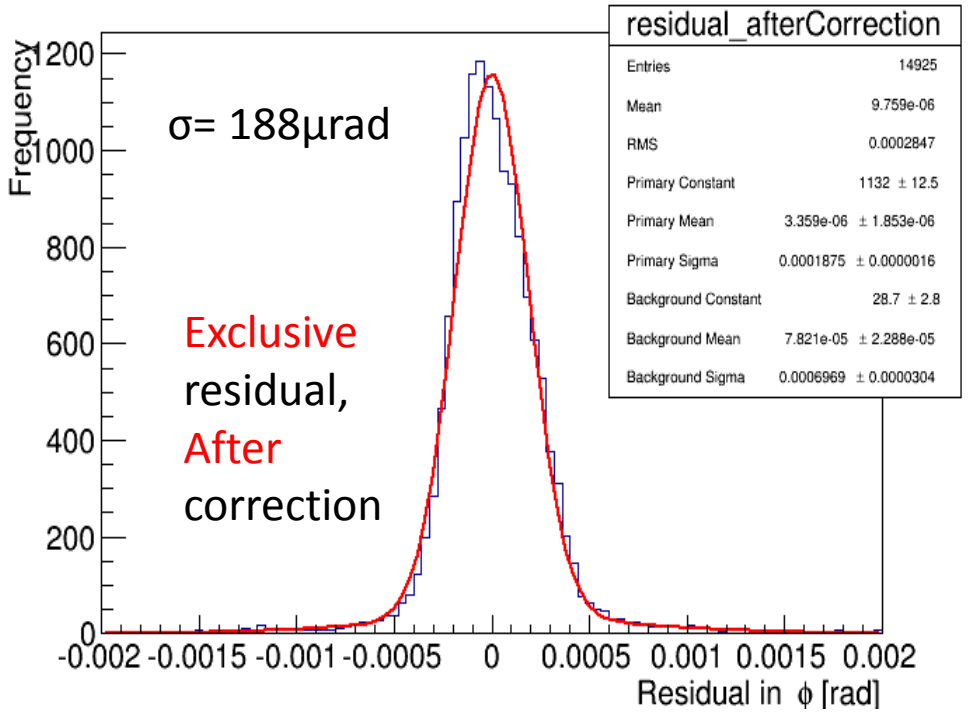
2-strip

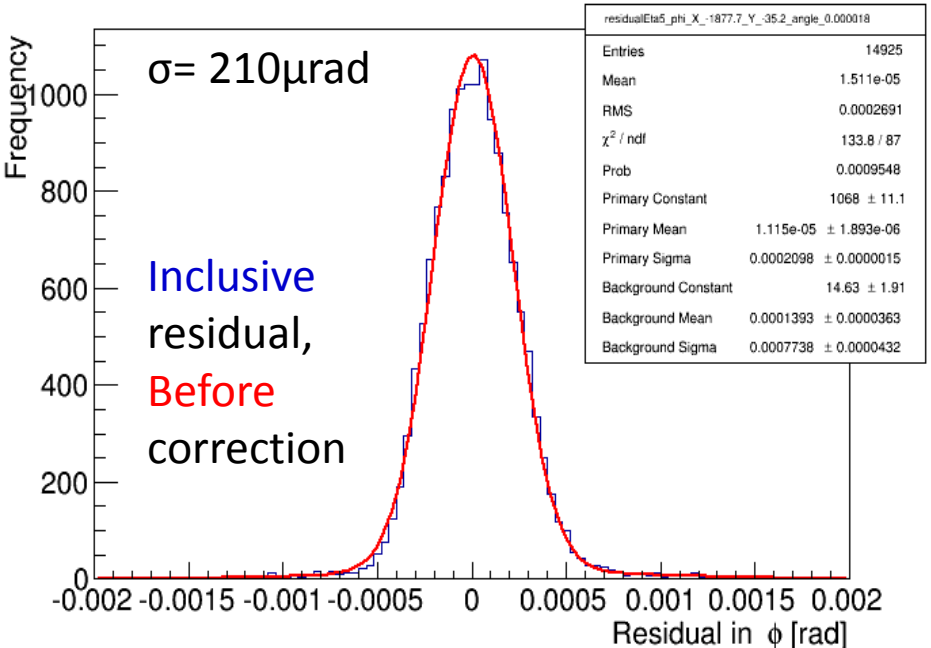


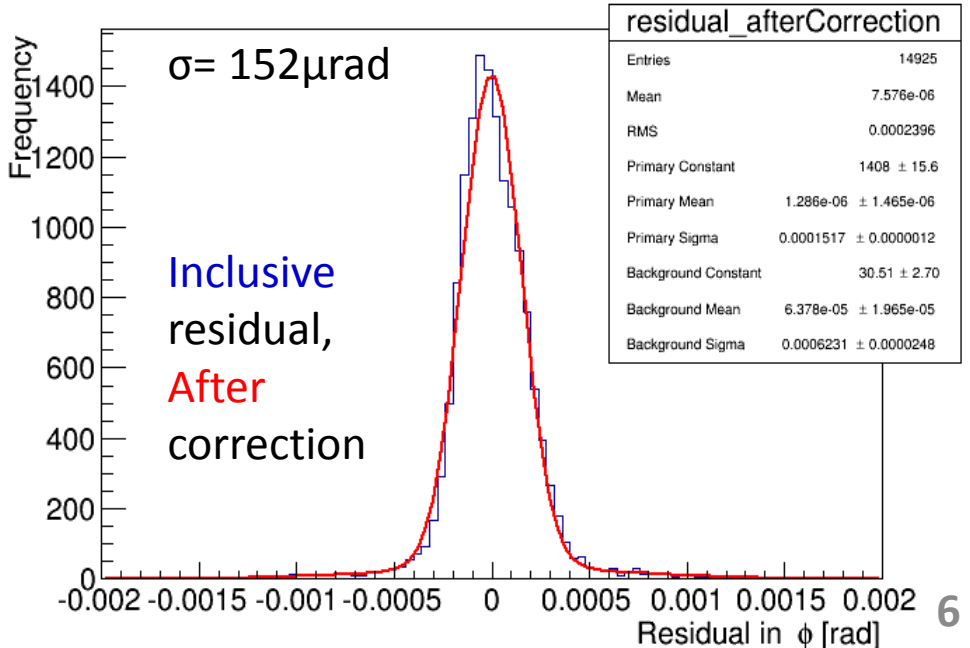


2 && 3-strip clusters

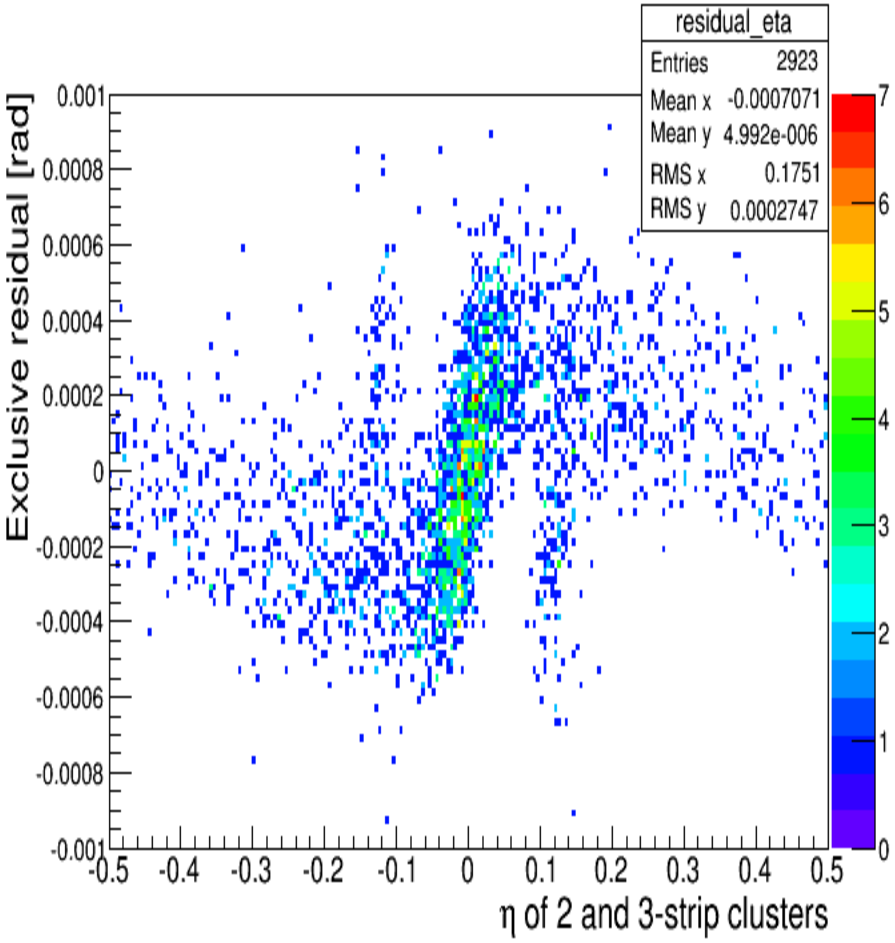




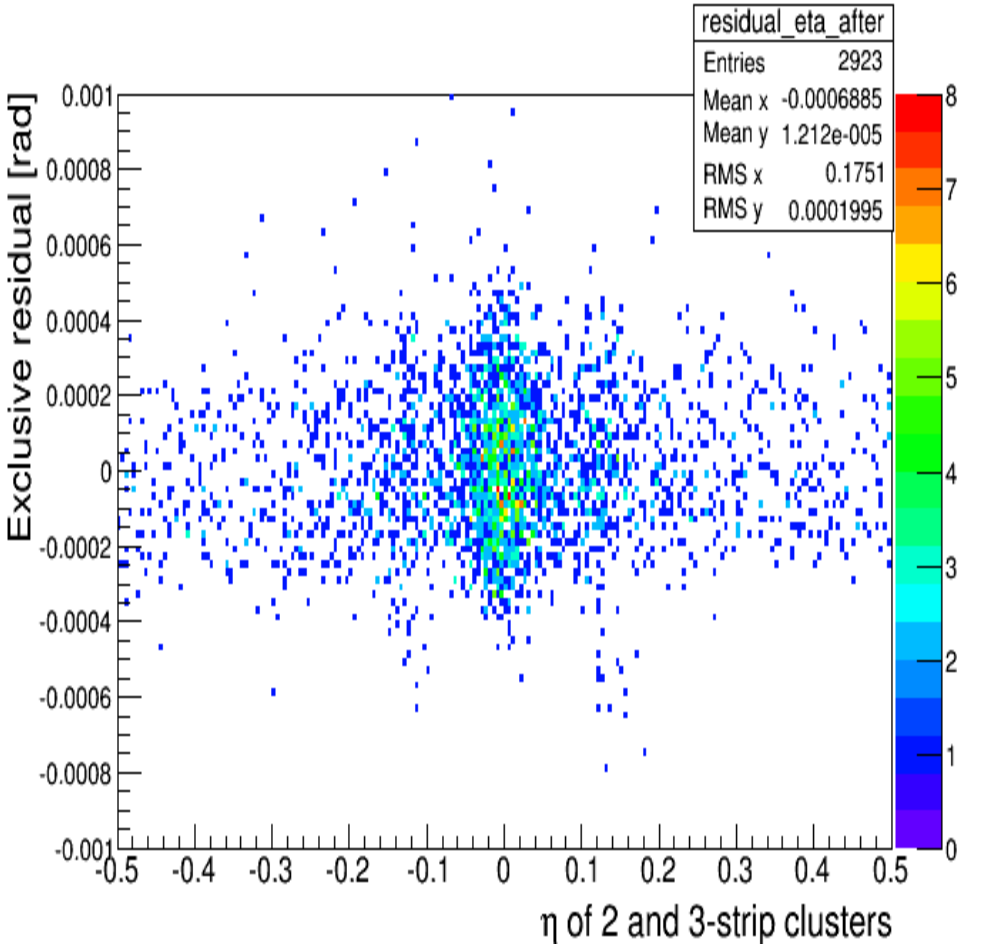




(exclusive) residual vs. eta plot @ 3400V for the zigzag (with 2 and 3-strip clusters)

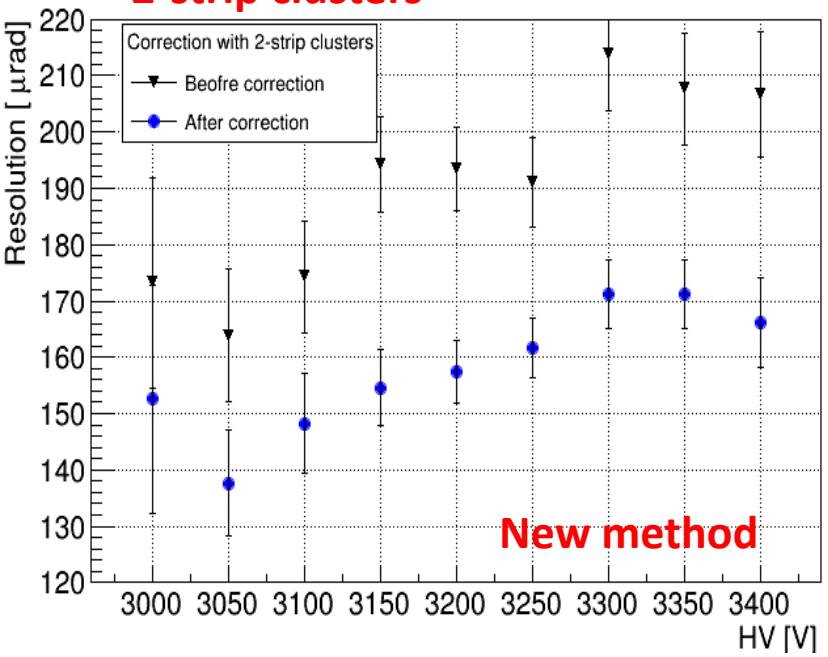


Before correction

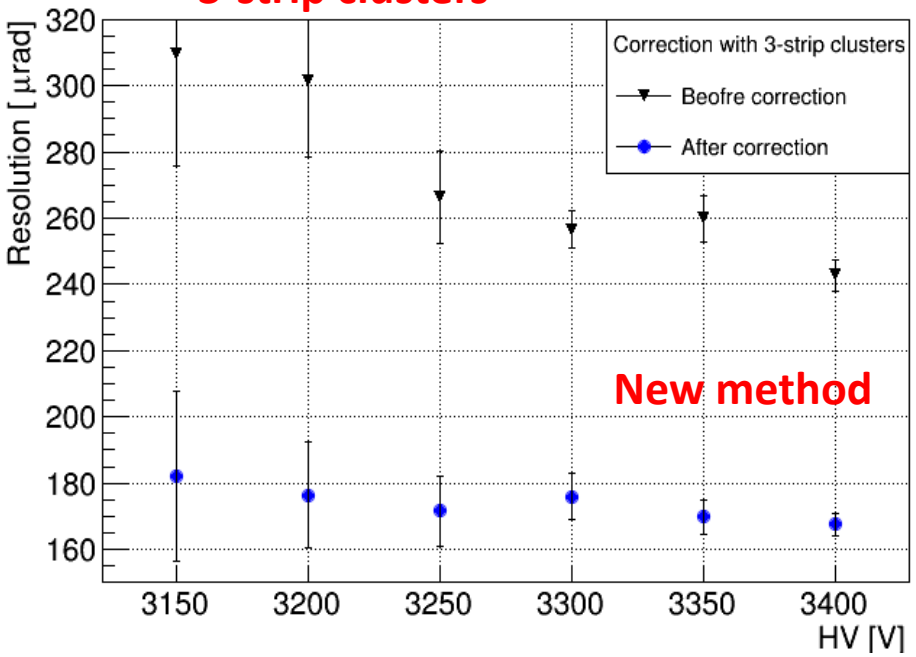


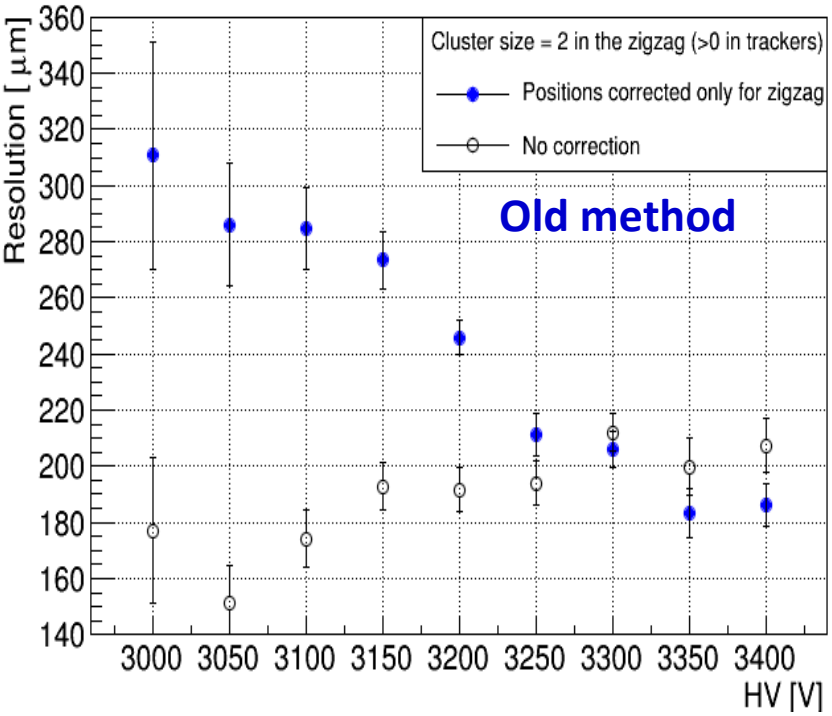
After correction

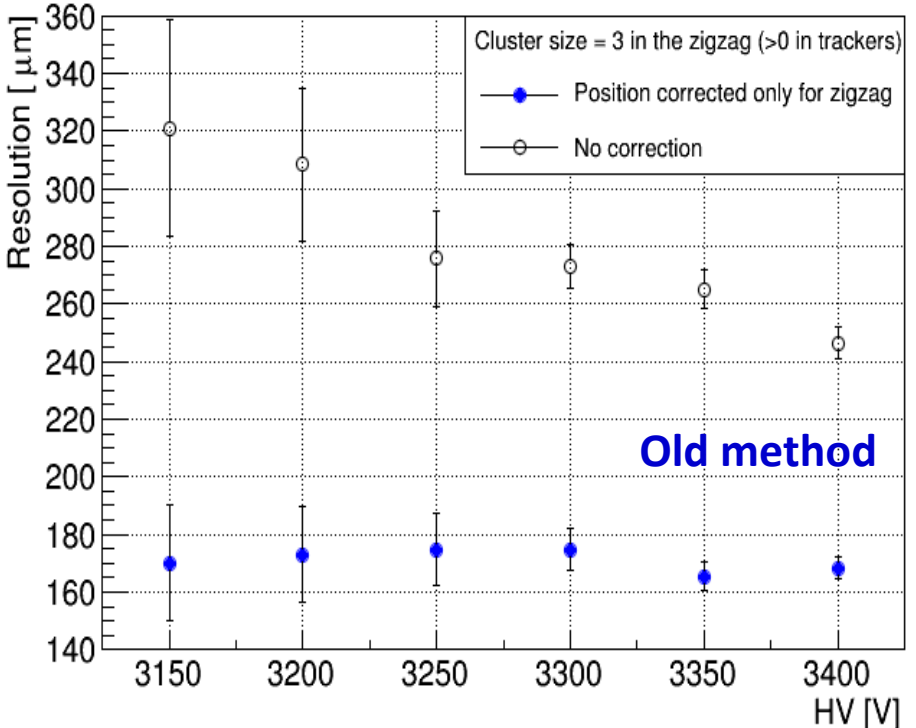
2-strip clusters



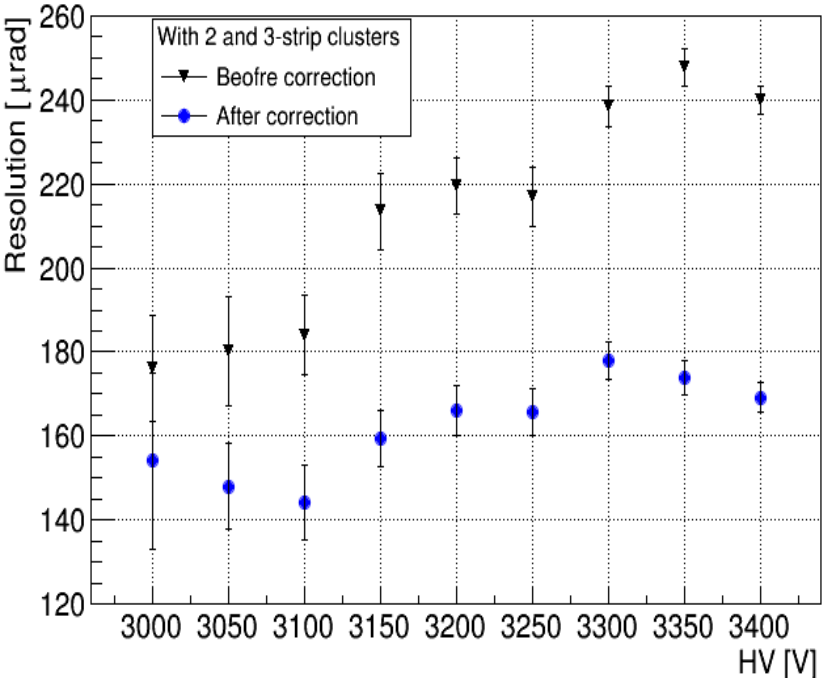
3-strip clusters



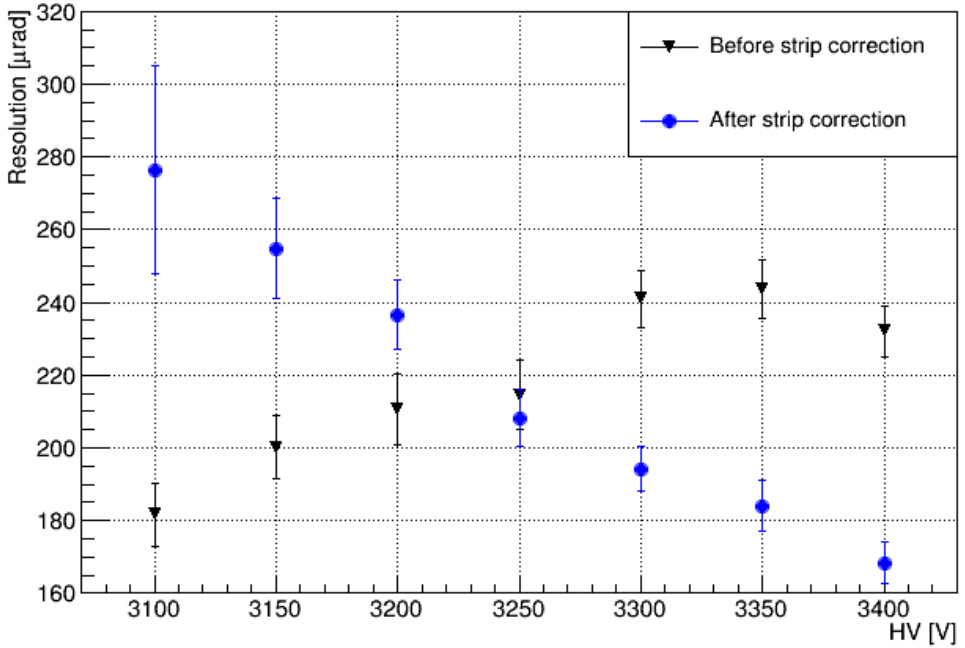




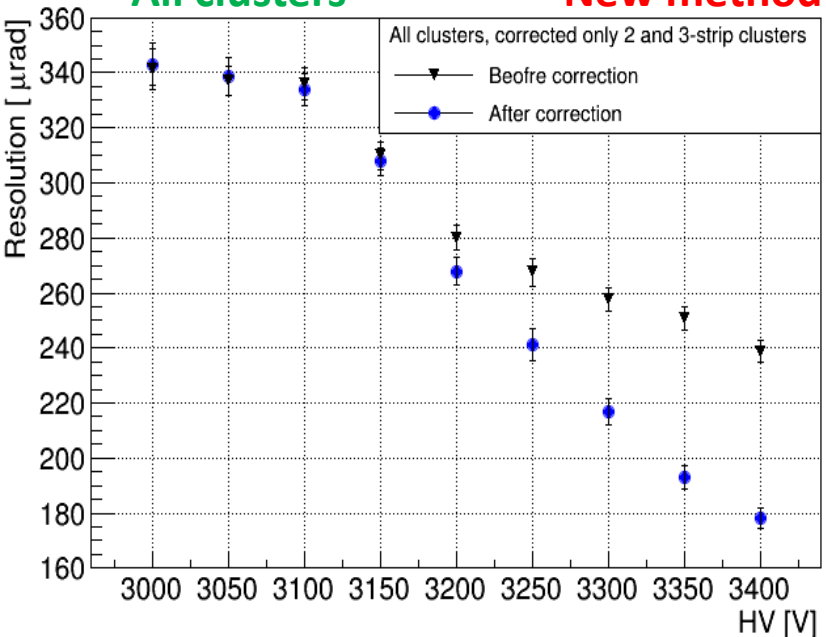
2 & 3-strip clusters — New method



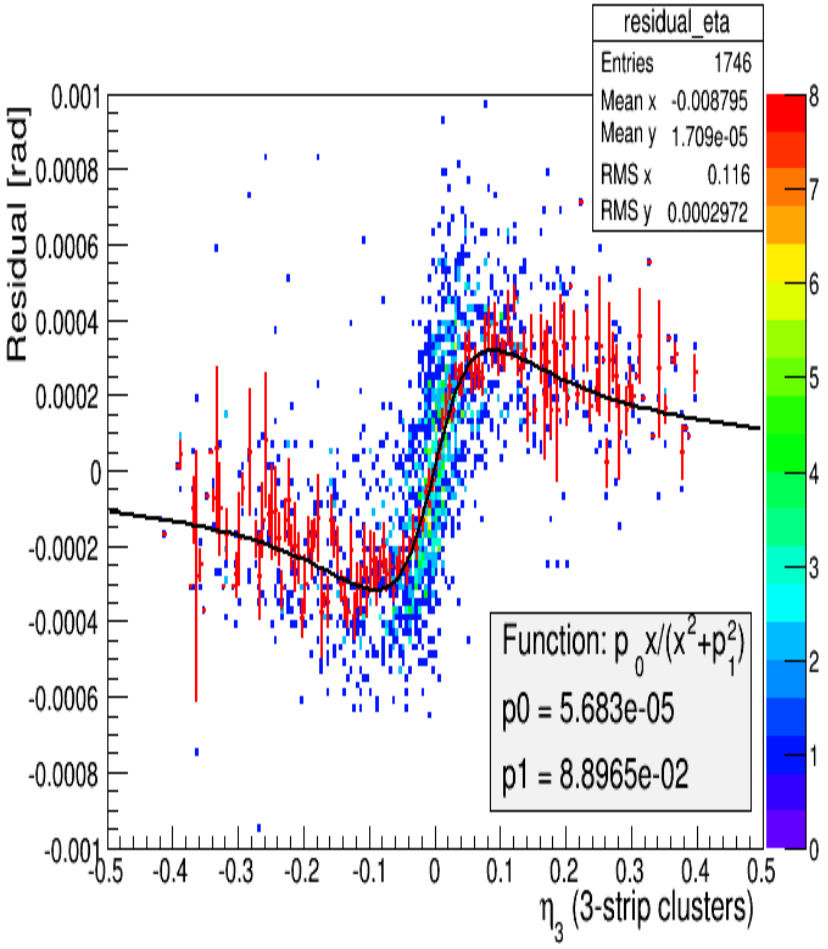
2, 3 & 4-strip clusters — Old method



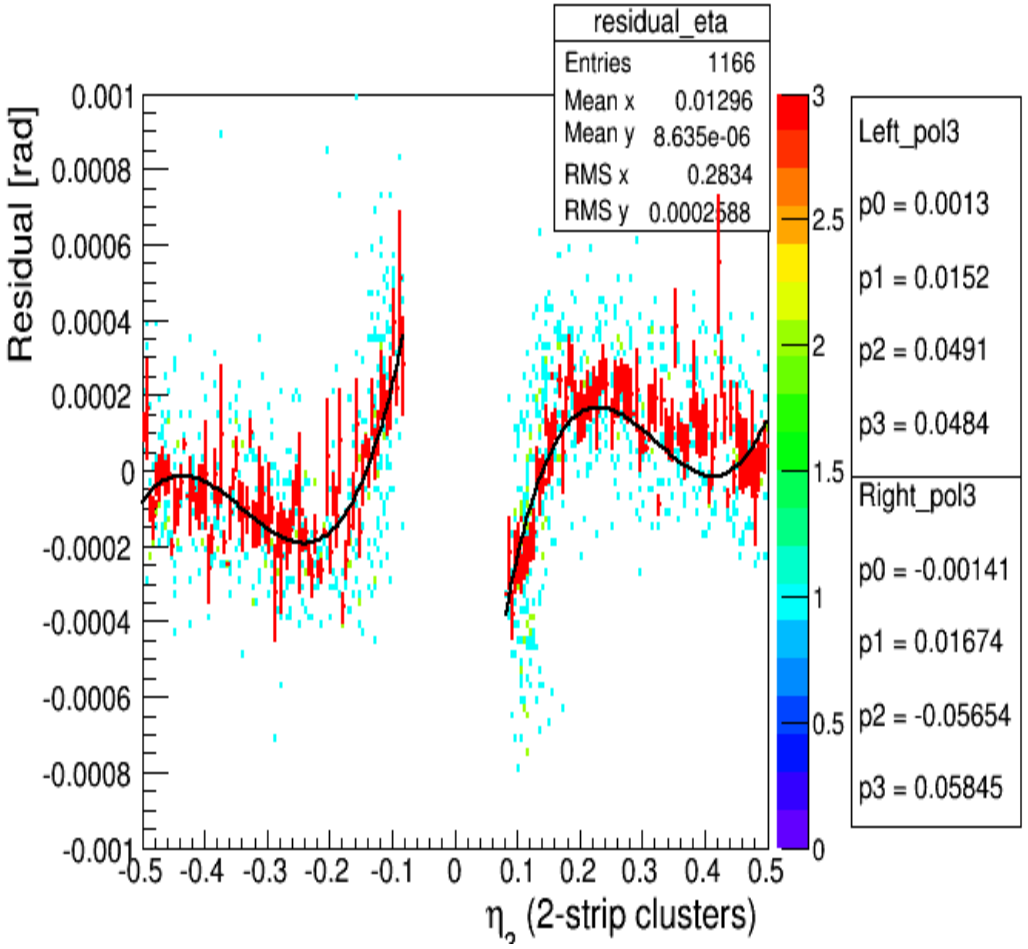
All clusters — New method



The plot on the left shows resolutions with all cluster sizes (N>=1):
No correction is applied for the black points;
Correction is (only) applied to 2 and 3-strip clusters for the blue points.



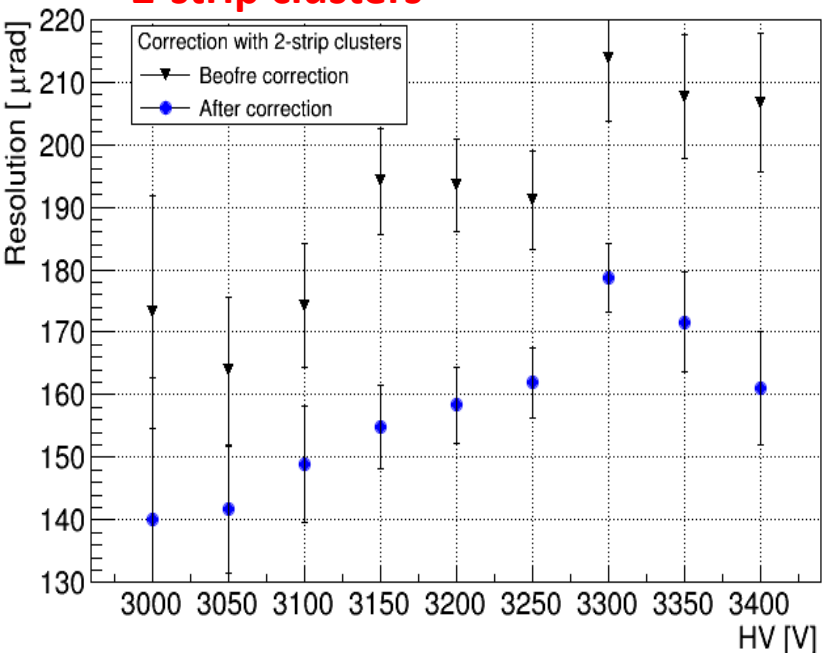
3-strip clusters



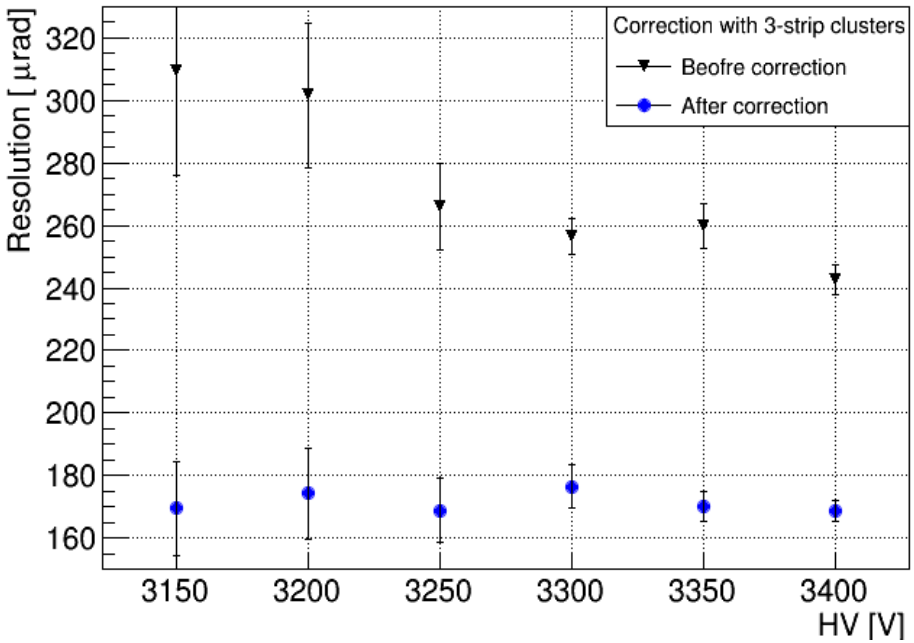
2-strip clusters

- **With 3350V data;**
- **3-strip clusters plot can be also fitted with the serpentine function; while 2-strip clusters plot can be fitted with two polynomials (degree 3).**

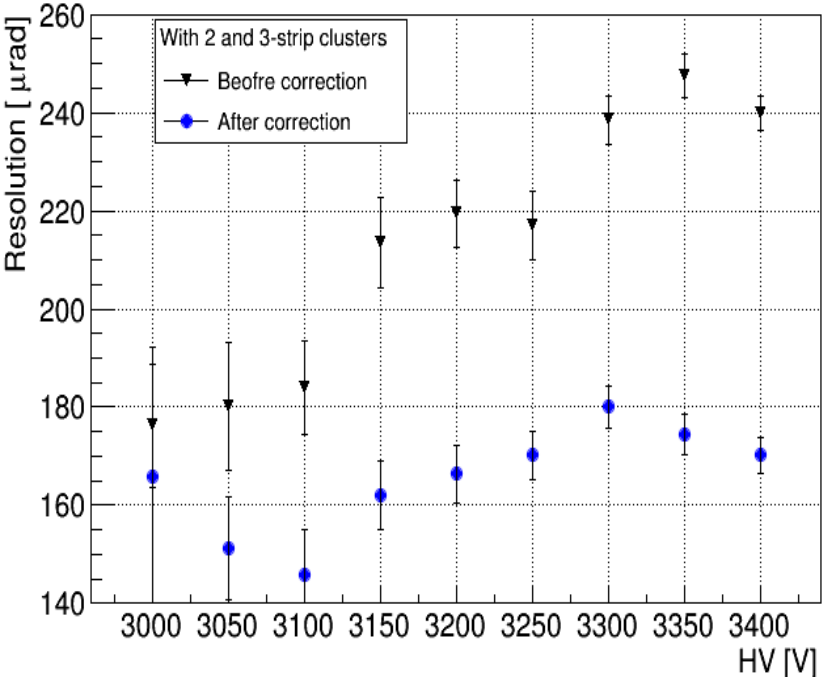
2-strip clusters



3-strip clusters



2 & 3-strip clusters



- **<u>Using the correction functions from 3350V data</u>, calculate both exclusive and inclusive residuals. Then get the resolution from geometric mean.**
- **The resolutions are similar to the previous ones corrected from “HV combined data”.**

Summary

- The new correction method builds 2D map of residual vs. η, with information of reference detectors. Then fits the curves with certain functions for different cluster sizes.
- The resolution results show big (& consistent for all HV points) improvement for both 2 and 3- strip clusters.

- Personal concern: the correction pulls residual towards zero on the 2D map, then in any case we'll get smaller residual width. For any probed detector in a beam test, e.g., U.Va's EIC GEM, FIT's Zigzag GEM and CMS GEM, this method improves resolution?